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ABSTRACT

Several surveys of students enrolled in elementary school mathematics methods courses provided the background for a pilot study of attitudes on teaching elementary mathematics. In a discussion of the literature on the subject, the importance of teachers' attitudes and their influence on children's attitudes is stressed. Two exploratory studies of attitudes towards a mathematics methods course led to the development of an Attitude Toward Teaching Mathematics Scale. This scale, which is appended to the study, tested variables that were found to be important in the previous tests, such as instructors, field experiences, mathematics achievement, and the impact of the fear of mathematics. The scale will be used as a dependent variable in a study to be conducted in 1981. (FG)

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AN INVESTIGATION OF SELECTED VARIABLES AND THEIR EFFECT UPON THE ATTITUDE TOWARD THE TEACHING OF ELEMENTARY SCHOOL MATHEMATICS BY PROSPECTIVE ELEMENTARY SCHOOL TEACHERS

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by

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Introduction

Most of the learning which occurs in the elementary school classroom is academic. However, in addition to thhe learning of facts, concepts, principles, etc., children also learn attitudes as a consequence of their experiences in school. A child's attitude towards mathematics is one such learned attitude. The development of a positive attitude toward mathematics will more likely result in the pursuance of further mathematical experiences, activities, careers, and study by the student than would the development of a negative attitude toward the subject (Simonson, 1979). Attitudes toward mathematics develop within the child as a consequence of experiences in mathematically-related experiences and the elementary school classroom is a primary source for such experiences. Therefore, the teacher who creates the learning environment and provides instruction to the child has a profound influence in determining the child's attitude toward mathematics. Consequently, the development of positive attitudes towards the teaching of elementary school mathematics by prospective elementary school teachers is an important factor in teacher training.

Background

Attitudes are not innate and during the formative years of elementary school the child's attitude towards mathematics is developed. Research shows that there exists a positive correlation between the attitude of the teacher and the attitude acquired by the child (Banks, 1964; Stedman and Breen, 1977). Therefore, the presence or absence of a positive attitude toward mathematics by the teacher and conveyed to the student is influential in the development of the child's attitude toward mathematics.

A study by Phillips (1973) indicates that a student's attitude toward arithmetic is significantly related to the attitude of the teacher. More specifically, he concludes that the attitude of the student toward arithmetic will tend to be positive if instructed by a teacher with either positive or neutral attitudes toward arithmetic, but will tend to be negative if instructed by a teacher with negative attitudes toward arithmetic.

Aiken (1972) states that a teacher's attitudes and effectiveness in mathematics are prime determiners of students' attitudes. In his book, LEARNING AND TEACHING ARITHMETIC, John H. Banks (1964) contends that the attitude of the teacher is by far the most significant contributing factor to the attitudes of the child regarding arithmetic.

In teaching mathematics, it is important that the teacher provide a learning environment and present the material through effective teaching methods which will contribute to the development of a positive attitude toward mathematics within the student. Just as the attitudes and effective teachings of the elementary school teacher will contribute to the feelings, beliefs and behavioral predisposition toward mathematics by the elementary children, so are the attitudes, feelings, beliefs and predisposition toward mathematics of those teachers influenced by their prior experiences.

Dutton (1951), for example, in a study discovered a tremendous outpouring of unfavorable feelings toward arithmetic in an investigation of prospective elementary school teachers' attitudes toward mathematics. He found that the university students who took part in this study came into the mathematics methods classes with many deep-seated, highly emotionalized, antagonistic feelings toward mathematics which had persisted since childhood as a result of their early mathematically-related experiences. These feelings were very prominent in the minds of the prospective teachers as they proceeded through their teacher training. In all of the statements made by these students regarding their feelings toward mathematics, only 26% of them were of a positive nature. A later study by Dutton (1962) further substantiated the findings of his 1951 study. In both

studies he found that once the feelings and attitudes of the prospective teachers were developed, they were tenaciously held.

A study by Smith (1964) showed similar trends. More than half of the 123 students in this study named elementary school years as the period during which their negative feelings toward mathematics were developed.

During their college experience, the preservice elementary teachers are exposed to and influenced by the two required mathematics content courses. Further mathematically-related experiences take place during the mathematics methods course. Both the content of these courses and the instructors influence the mathematics attitude of the preservice teacher. These mathematically-related content and method courses provide the final influencing factors to have a measureable effect upon the attitudes, techniques, and achievement of the student before he/she goes out to begin teaching elementary school mathematics.

Methods

An exploratory study was conducted in the spring semester of 1980 in order to receive feedback from the students enrolled in the Elementary School Mathematics Methods (ESMM) Course regarding their feelings concerning several aspects of the course. Approximately 97% of the students enrolled in the course were female. The results from this study gave further insight to some of the variables affecting their feelings regarding mathematics-related experiences.

During the spring semester 1980, 86 students enrolled in the three sections of the ESMM course at the University of Houston were asked to respond to the "Attitude Scale Regarding ELED 4315", the elementary school mathematics methods course. This scale was designed to obtain feedback from the students concerning several aspects of the methods course. The 20-item scale was factor analyzed using a SPSS program with a varimax rotation for two of the three classes. The sample size of this first run was 59 students. By reviewing the items which factored out at the significant correlation of .40 or above with each factor, as suggested by Kerlinger (1979), the factors were identified as a measure of the following. fear of mathematics, skills gained from the ESMM course, attitude toward teaching mathematics, feelings regarding field experiences, and feelings regarding the methods and materials presented in the course to use in the elementary classroom.

The second run included the data from all three sections of the ESMM course resulting in a sample size of 86 students. The data was factor analyzed resulting in a few differences to be noted from the first run.

Run 1 resulted in factor 1, which accounted for 29% of the variance, correlating significantly with items concerning confidence in teaching mathematics and skills gained from the course which contributed to that confidence. Factor 2 was a measure of fear of mathematics.

In run 2 these factors were reversed with the fear of mathematics accounting for 27% of the variance corresponding to factor 1. This was followed by factor 2 which was the confidence factor identified in factor 1 of run 1. The remaining 4 factors remained the same for both runs. A Cronbach's Alpha was used to give a measure of reliability among the items for each factor 1 through 6 resulting in a measure of .613, .491, .741, .243, .531, .346 respectively for each factor in run 2.

An item by item analysis indicated that although the feelings of the third class resulted in fear of mathematics being a primary factor and one which accounted for the greatest amount of variance, the correlation on such items as feeling that the methods and materials were appropriate for use with an entire class and feeling they were capable of not just teaching on a one-to-one basis only was in a

definite positive direction. Both run 1 and run 2 displayed like correlations for items and factors regarding time spent in the field experience or working with children.

Through this exploratory study of attitudes regarding the course and analyzing the differences between run 1 and run 2, the researcher noted that although the three sections received the same assignments and were structured similarly, the instructor and the field experiences were different. Also noted was the difference between the groups regarding the impact of the fear of mathematics. Therefore, it was believed that these variables should receive further consideration and investigation.

During the fall semester 1980, an Attitude Toward Teaching Mathematics Scale was developed. This scale was administered to 79 students enrolled in the MSMM courses at the University of Houston Central Campus and Clear Lake Campus. The sample was approximately 95% female. A factor analysis was conducted on the 21 items of the scale using a SPSS program with a varimax rotation. A Cronbach's Alpha was used to give a measure of reliability for internal consistency of the items on the attitude scale. The first factor in the analysis accounted for approximately 40% of the variance. The scale has a reliability coefficient of .88. The attitude scale is in the appendix of this paper. This

scale will be used as the dependent variable in a study to be conducted in the spring semester 1981. It is the purpose of this study to investigate the extent to which the attitude toward mathematics, the achievement of mathematics, the attitude toward the elementary school mathematics methods course and instructor, and the type of field experience influence the prospective elementary school teacher's attitude toward the teaching of elementary school mathematics.

Conclusions

From the pilot study conducted in the spring 1980, it was noted that although students have a fear of mathematics, they feel generally positive about the teaching of mathematics in the elementary school to an entire class as a result of their experiences in the ESMM course. They were more positive in this regard than the group with less fear of mathematics. The differences between the two groups were noted to be a difference in instructor and differences in field experience. It was believed that the influence of the field experience, instructor, mathematics achievement, and attitude toward mathematics were variables contributing to the preservice teacher's attitude toward the teaching of elementary school mathematics based upon the review of the literature and this pilot study.

From the information gained in the exploratory study and the development of a reliable instrument to measure the attitude toward teaching mathematics, a further study will be made during the spring semester 1980 regarding the attitude toward teaching mathematics of the prospective elementary school teachers and the variables contributing to that attitude. Among the variables to be considered and/or measured by appropriate instruments are a) the attitude toward mathematics as measured by the Revised Aiken and Dreger Mathematics Attitude Scale, b) the attitude toward the ESMM course and instructor as measured by the Teaching

Effectiveness Questionnaire used by the Department of Curriculum and Instruction in the College of Education at the Univeristy of Houston, c) achievement in mathematics as measured by the Elementary School Competency Tests used by the Houston Independent School District, and d) the type of field experience in which the preservice teacher participates. Using the Attitude Toward Teaching Mathematics scale developed in the second pilot study as the dependent variable, multiple regression analysis will be used to determine to what degree each of the independent variables account for the variance in the dependent measure.

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APPENDIX

ATTITUDE TOWARD THE TEACHING OF MATHEMATICS

For the following statements circle 5 if you strongly agree with the statement, 4 if you agree somewhat with the statement, 3 if you neither agree or disagree with the statement, 2 if you somewhat disagree with the statement, or 1 if you strongly disagree with the statement. Please answer ALL questions in a manner which best reflects your feelings.

		strongly agree	agree	neutral	disagree	strongly disagree
1)	I am looking forward to teaching elementary school mathematics.	5	4	3	2	1
2)	My ability to perform mathematical computations is adequate for teaching elementary school mathematics.	5	4	3	2	1
3)	I have feelings of inadequacy in teaching elementary school mathematics.	5	4	3	2	1
4)	I feel comfortable about my ability to teach elementary school mathematics to an entire class.	5	4	3	2	1
5)	I feel that I can adequately teach the concepts of a fraction.	5	4	3	2	1
6)	I feel highly anxious in thinking about teaching elementary school mathematics.	5	4	3	2	1
7)	Teaching mathematics to children will be fun and exciting.	5	4	3	2	1
8)	My understanding of mathematical concepts is adequate for teaching elementary school mathematics.	5	4	3	2	1
9)	I feel comfortable about my ability in teaching a child on a one-to-one basis only.	5	4	3	2	1
10)	I feel that I can adequately teach the concepts of whole numbers (the base 10 system).	5	4	3	2	1
11)	I feel comfortable about my ability to teach elementary school mathematics in small groups.	5	4	3	2	1
12)	I feel inadequate to teach operations with fractions.	5	4	3	2	1
13)	I feel very confident about my ability to teach elementary school mathematics.	5	4	3	2	1
14)	Teaching elementary school mathematics will be boring for me.	5	4	3	2	1

		strongly agree	agree	neutral	disagree	strongly disagree
15)	I feel that I can make mathematics interesting for the children I teach.	5	4	3	2	1
16)	The thought of teaching elementary school mathematics frightens me.	5	4	3	2	1
17)	When at all possible, I will avoid teaching mathematics to my students.	5	4	3	2	1
18)	Elementary school mathematics will be easy for me to teach.	5	4	3	2	1
19)	I feel the teaching of elementary school mathematics will be dull and repetitive for me.	5	4	3	2	1
20)	I feel that I can adequately teach whole number operations.	5	4	3	2	1
21)	Mathematics will be the most difficult elementary school subject for me to teach.	5	4	3	2	1